

Space Science Seminar

Tuesday, 2015 July 28

10:30 a.m.

NSSTC/4078

The Europa Clipper: NASA's Next Solar System Flagship Mission

Dr. Melissa McGrath / SETI Institute, NASA/MSFC-emerita

Europa, one of the four large moons of Jupiter discovered by Galileo in 1610, has been a high priority target for NASA's solar system exploration program since the Galileo mission provided strong evidence for an extensive, subsurface liquid ocean sandwiched between a potentially active silicate interior and a highly dynamic surface ice shell. According to the 2013 Solar System Decadal Survey Europa ***“offers one of the most promising extraterrestrial habitable environments, and a plausible model for habitable environments beyond our solar system.”*** Slated for launch some time in the 2020s, the Europa Clipper mission is designed to investigate Europa's potential habitability. The mission has recently passed Key Decision Point A, and instrument selections were announced in June. The mission is of interest to MSFC because of the possibility that it will be launched on the SLS. This talk will provide a brief overview of the science goals and mission architecture, as well as a short summary of the instrument complement just selected.

Habitability: Ingredients for Life

Water:

- Probable saltwater ocean, implied by surface geology and magnetic field
- Possible lakes within the ice shell, produced by local melting

Chemistry:

- Ocean in direct contact with mantle rock, promoting chemical leaching
- Dark red surface materials contain salts, probably from the ocean

Energy:

- Chemical energy could sustain life
- Surface irradiation creates oxidants
- Mantle rock-water reactions could create reductants

A Europa mission would verify key habitability hypotheses

The diagram illustrates the internal structure of Europa, showing the layers from the surface down to the rocky mantle. At the top, Jupiter is visible in the background. The surface is labeled 'Surface Temp ~ -107° C'. Below the surface is a 'Possible Melting Ice' layer. Underneath that is a 'Soft Convecting Ice ~20 km?' layer. A 'Fracture Network' is shown within the ice. Below the ice is a 'Relatively Smooth Undersurface'. The next layer is a 'Salty Ocean ~100 km?'. Below the ocean is a 'Rocky Mantle' with 'Magmatism' and a temperature of 'Temp ~ 1300° C'. Arrows indicate 'Convection' in the ice layer and 'Hydrothermal Circulation' between the ocean and the mantle. A NASA logo is in the top right corner.

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